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System Requirements Reconstruction the Living Environment of Big City

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Abstract: Today in the big cities there is a minimum full-fledged existence of a person in connection with disorderly, "spontaneous" the intensification of the use of internal reserves of urban areas. The residential building as one of the main elements of the urban environment, does not meet the requirements stipulated by the new social, environmental and technical-and-economic, life conditions of the population. In conditions of transition to sustainable development it is necessary to revise the methodological approaches to solving the reconstruction problems of the residential environment, as one of the means of optimization space for the livelihoods of the urban population. The article proposes the application of a systems approach to define and justify the object of reconstruction, as well as the specifics of this type of architectural and urban development activities.

Key words: Sustainable development · Living environment · Reconstruction · Ecology · The system approach · Methodology · Demoecosystem · Optimization · Modeling

INTRODUCTION

The increasing demands of the urban environment due to natural multi-faceted process of development, lead to the fact that the traditional methods of solution of town-planning problems, connected with the optimization of the urban environment, become less effective. In addition to urban issues associated with the quantitative growth of production capacities, urban infrastructure, communications, not less important problem of urbanization is the comfort level of the urban environment [1]. The comfort of the urban environment is a subjective sense and objective state of complete health under the conditions of the human environment of the urban environment, including its natural and socio-economic indices [2]. Establishment of a sustainable, high-quality living environment for the population is among the most important tasks in ensuring the sustainable development of the cities ("sustainable development") [3, 4].

The Methodology: The determining factor of the level of development, both for the individual settlements and for the country in general, is the quality of the living environment, where are realized major physiological and household needs of the population. The increasing difficulty of the sphere of dwelling requires, in turn, from architects and urban planners, a more precise definition of the object of science and practices and for the application, alongside the traditional creative methods of research, design and optimization of system methods of quantitative analysis using possibilities of modern information technology [5]. In this regard, is not in doubt the need for revision and adjustment of traditional ideas about the ways of reconstruction of the residential environment of big cities.

The Main Part: The transition to sustainable development requires fundamental changes, the center of which is the greening of all major activities of mankind, man change his mind and the creation of a new "sustainable society" as the area of the mind [6, 7]. The basis for our understanding of the directions of transformation of such an important and multi-faceted type of architectural and town-planning activity as the reconstruction should be based on a new interpretation of the specifics of this type of activity. Today, the term "reconstruction" is considered only in relation to the material-technical component of the architectural environment and does not reflect the ecological system of

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the nature of the required transformation of architectural and urban sites. A number of the adopted definitions confirm this position: reconstruction (re.. and lat. constructio - building) - 1) radical reorganization, restructuring with the goal of improving improvements (e.g., reconstruction of enterprises, reconstruction of the city). 2) restore the original appearance of something on the balance or written sources (e.g., reconstruction of a monument of architecture) [8]. As per article 14.1 of the town planning code of the Russian Federation, reconstruction of objects of capital construction (except for linear objects) - change the settings of the object of capital construction, its parts (height, floor number, area, volume), including superstructure, reconstruction, expansion of the object of capital construction, as well as replacement and (or) recovery of bearing building constructions of capital construction object, except for the replacement of certain elements such structures on similar or different improve the performance of such constructions elements or restoration of these items. In this study, reconstruction is understood as a process aimed at improving the conditions of life and harmonization of relationship and interaction of the population and its habitat.

Not interchangeable processes of human activity, for which you must provide a special, peculiar architectural space, divided into the following types: production, life, rest and transport [9, 10]. A special place among them is occupied by household processes that shape the requirements for the residential environment, where a person spends over half of his life. Architecture of dwelling and social infrastructure actively influence on the physical and moral health, largely determining the formation of comprehensively developed personality. It determines the variety of properties that define the quality of the design solutions for reconstruction of the living environment, which with a certain degree of conditionality can be described by three categories of indicators: functional (identified with the comfort and the conveniences), economic (cost) and aesthetic (architectural). A distinctive feature of the process of reconstruction of residential areas is not only restoration of lost in the process of exploitation qualities of the urban environment, but also the registration of the newly emerging demands associated with scientific and technical progress and infrastructure (demographic, socio-economic etc) changes.

Successful implementation of the concept of sustainable development is closely connected with the holistic view of the process optimization of the interaction between man and environment and thus overcoming the "environment" of the crisis. Various aspects of the solution of this task are engaged in such scientific directions as social ecology, which is understood as the science of the system «society - nature» and this interpretation is associated with the concepts of the global environment and noospherology, though they are conceptual and terminological distinction; urban ecology - representing one of the directions of social ecology, subject of which is the vital activity of human populations in the urban environment, i.e. the system "man - city", which historically occurred and is in continuous space-time traffic [11]; town-planning ecology studying architectural and planning laws of regulation of interaction of the man, human and natural environment with a view to creating favourable conditions for their protection, reproduction and co-evolution (joint harmonic development) [12].

Analysis of methodological approaches to the definition of the object architectural activity has allowed to establish, that in 1980 it was successfully defended the position that the object of architectural science is not a technical system regulated on the basis of technical and economic criteria and the system of interaction of the population and its habitat, ecological system - "demoecosystem" (a term coined in the early 1970s) [13], which consists of three subsystems: "population", "built environment" (architecture) and "habitat" (natural) (Fig.1-a).

The nature of these subsystems is the following (Fig.1-b), that the population affects the nature indirectly through architectural objects (urban) environment: material production, social infrastructure, recreation and communications. Human contacts with the natural surroundings are very specific to biological systems, so in Fig.1-and between nature and the population is reflected only direct link: E→N. Permanent development of the built environment can be carried out only at the expense of the natural; it causes the output to the level of marginal relevance of environmental issues, which in the modern world situation cannot be considered outside the context of the impact of the built environment [14].

Thus, as the object of reconstruction can be considered demoecosystem type "population ↔ environment" of a certain hierarchical level, "element-motivator" where is the population that identifies the target function.

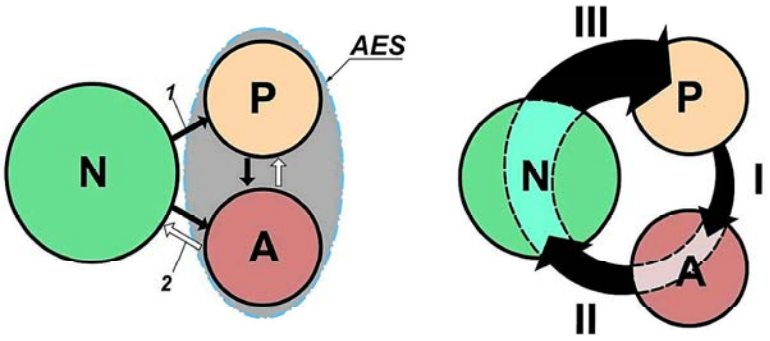

Fig. 1: The principle structure model of the ecological system "POPULATION ↔ ENVIRONMENT" - demoecosystem. a - functional model of demoecosystem; b - principle of mutual influence and interdependence of elements (subsystems); P - population; N - natural (natural) environment; and A - artificial (architectural) environment; AES - artificial ecological system; 1 - direct connection; 2 - feedbacks; I - have made a mistake at the stage of research and/or design; II - error materializing and acting in time, adversely impacts the environment; III - the systematic negative impact invalid the natural landscape of the health of the population.

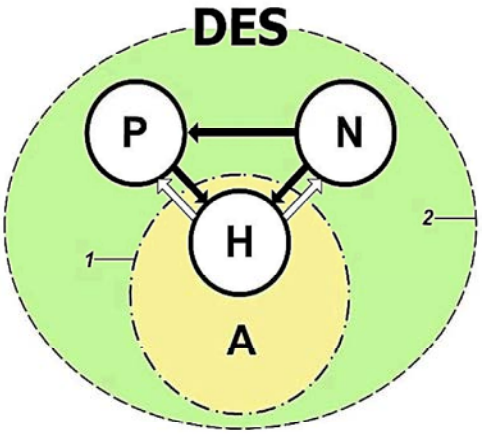

Fig. 2: The place of dwelling in demoecosystem
DES – demoecosystem; P - population; N - natural (natural) environment; A - artificial (architectural) environment;H- living environment subsystem ("housing"); 1-border subsystem "artificial environment; 2 - border demoecosystem.

AES= P ↔ (PR ∩ S ∩ R ∩ C),

where: AES- artificial (architectural) ecological system; P - population; PR - production sphere; S - service sphere (social infrastructure); R - recreation; C- communication (connection); (PR ∩ S ∩ R ∩ C) - an artificial environment of life of the population; ∩ - sign association; ↔ - direct and feedback [15].

From the point of view of the relationship between knowledge of the subject to the object under investigation, study of the processes of functioning and optimization demoecosystems suggests a systematic and interdisciplinary, due to the unity of man and environment.

Structural ontological model of the ecological system of the population (Figure 2) reflects the position in it "home" as a subsystem of the built environment - space for the realization of the fundamental individual needs: physiological needs for safety and security, social needs. The formation of the living environment is based on the factors defined population (P), as well as natural conditions of the place of construction (N) and figure this impact is reflected arrows direct connection.

Based on a spatial (structural) analysis demoecosystem revealed that in determining the method of reconstruction of the objects of this kind arises the necessity of the account of factors, causes, driving forces or the basic conditions of the course of the process, affecting each element of the reconstruction project. As systemically important factors influencing the adoption of the decision on reconstruction of residential environment adopted:

- Factors reflecting the activity parameters of the population as a social and biological object (social, demographic, environmental);
- Factors set out the necessary requirements for ecological parameters reconstructed objects, regulating the interaction degree interaction of the population and the natural environment;
- Factors determining the feasibility and functional parameters of the reconstructed sphere objects of the home, based on scientific and technical capabilities for a specified period.

From the point of view of system approach demoecosystems should be regarded as public - free exchange with the environment of mass and energy, are all self - organizing systems with complex organized and dynamic internal structure [13]. At each stage of the implementation of reconstruction of events - stage of conceptual development and scientific research of alternative engineering, in the process of construction, determining factors along with technical and economic characteristics, will be the factors reflecting a "savings" system, which would ensure the creation of an integrated and self-sufficient environment conducive to the formation and preservation of the moral health of the people.

Methodologically important for making decisions on reconstruction of architectural and urban sites is that complex systems do not permit any change in any one factor, because these systems are so dynamic and internally connected, that change is just one factor causes changes in other, sometimes many factors [5].

The epistemological foundation of environmental problems in general and optimization of architectural and spatial environment, as one of the ways to overcome them, in particular, lie in the sphere of interdisciplinary relations in science, obviously, that the information support for solving the tasks of reconstruction demoecosystem requires integration of information data in natural, humanitarian and technical sciences [16].

Urban science, establishing basic provisions of architectural and planning organization of urban systems, unable without information support address managerial relationship between the economic activity of the subjects of the town-planning activity and the structure of the town-planning systems, to determine their exact dynamics and processes of development. These difficulties indicate the need for improvement and expansion of information aspects of a sustainable spatial development of the territory. The use of information systems allows to overcome gaps and functional, planning, spatial indicators and impact on the architectural and planning organization of urban systems by assessing the objective of demographic, economic, environmental and social processes, accounting interaction directions of socio-economic and urban development of territories, as well as the real dynamics and structure of investment and regional resources [17].

Spatial slice of the decision of reconstruction tasks of the residential environment, should be based on quantitative factors reconstruction external to the transformed system, specified as the upper hierarchical level.

Functional slice, in turn, must be provided with qualitative indicators that characterize a system by the presence or absence in it of subsystems, providing strategic processes (respectively): - *production*, in this case, connected with the reproduction of the material (demographic) component of the system and software «production» the processes of vital activity of the population as such; - *domestic*, in this case, aimed at ensuring social needs of the population, the so-called cultural-consumer services; *recreational* - rest, treatment of the population; *communication* to ensure interconnection and exchange of matter, energy and information between the above groups of processes.

As noted in their study, Dontsov D.G.: "Introduction of information systems in urban regulation in the process of creating documentation, town-planning activity is directed on the complex decision of development problems of the territory such as: increase of efficiency of use of built-up areas and subject to development of territories; balanced development of the territory of the functional zones; optimization of the ecological state of urban areas; improvement of integrated indicators environmental organization of the territory; security residential area of infrastructure. As a result of this reduced the cost of the achievement of the normative characteristics of the land use and construction; newly organized and reconstructed environment qualitatively improved, in line with quantitative indicators of development; population change, as well as a number of industrial objects and forms of its future functioning occurs more reasonable" [17].

However, volume and complexity of the objectively existing information subject to accounting, exceeds the capabilities of man and even of the system "man-machine", so if the comprehensive approach is applied way of consistently (graded) accounting factors; most of the data are not comparable and incommensurable; part of the data is in respect of contradictions and requires special treatment applicable to a given problem; and others slfuch an approach reflects a stage in the development of architectural methodology, characterized by predominantly empirical, inductive methods of research. Practice shows that in the conditions of the increasing complexity of tasks, comprehensive concept raises doubts about its effectiveness. Compared with other methods of an integrated approach has, it would seem, the greater objectivity, but this path leads to errors [18].

Way out of the situation is possible through the application of a systematic approach to the study of the reconstruction process. In accordance with the functional

and spatial structure of the objects of architectural and urban development activities, tasks solved in the process of reconstruction of residential environment, can be classified into four types. These are the tasks associated with the optimization of each of the subsystems of the object of reconstruction: housing, home, recreation, communication spheres of life of the population. Each type of tasks should correspond to a certain type of reconstruction, aimed at optimizing not only the "weak link" of the system, but also objects systematically associated with it.

CONCLUSION

On the basis of conducted researches it is established, that the effective decision of tasks in the process of reconstruction variant of architectural and urban design is possible only with the use of methods based on the methodological principles of GTS (General theory of systems). Method of cybernetic modelling demoecosystem seems to be one of the main and the most promising for research and development of alternative solutions on reconstruction of architectural and urban sites. Crucial for decision-making by type of reconstruction of the objects of all hierarchical levels of complexity have functional models, reflecting the dependence and forms of behaviour of the simulated objects. Application of functional models will allow to solve the tasks of reconstruction of architectural and town planning projects not only at the design level, but also at the stage of research and forecasting.

Consequence: Reconstruction of a residential environment, with the aim of comprehensive improve its quality, is enduring, as relevant social, economic and a number of other points of view.

Solution of problems of reconstruction requires not only special knowledge in a separate component of the problem and systemic thinking, which is based on the identification of the principles of "behavior" of the systems based on fundamental and immutable laws of the universe ("laws of nature")that need to be considered, but cannot be changed.

As the object of architectural reconstruction should not be considered "technical" system (artificial environment as the material sphere of the processes of vital activity of the population) and the ecological system "population l environment" - demoecosystem.

Method of cybernetic modelling demoecosystem will allow to solve the tasks of reconstruction of architectural and urban objects of the optimum.

Information technologies, realized with the use of modern computer equipment, provide the necessary flexibility and credibility in obtaining and processing of initial information on solving problems of the optimization of the objects of architectural and urban development activities.

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